

MINUTES

FutureArctic/FORHOT – 10th formal project meeting

On-line

and from a following workshop entitled *“Joint Ecosystem Assessment on the Effects of Natural Soil Warming and N-input Manipulation on Subarctic Grasslands and Forests”* 1-3 March, 2021

Attending: Altogether 49 ForHot and Future Arctic participants attended the meeting when most were on-line.

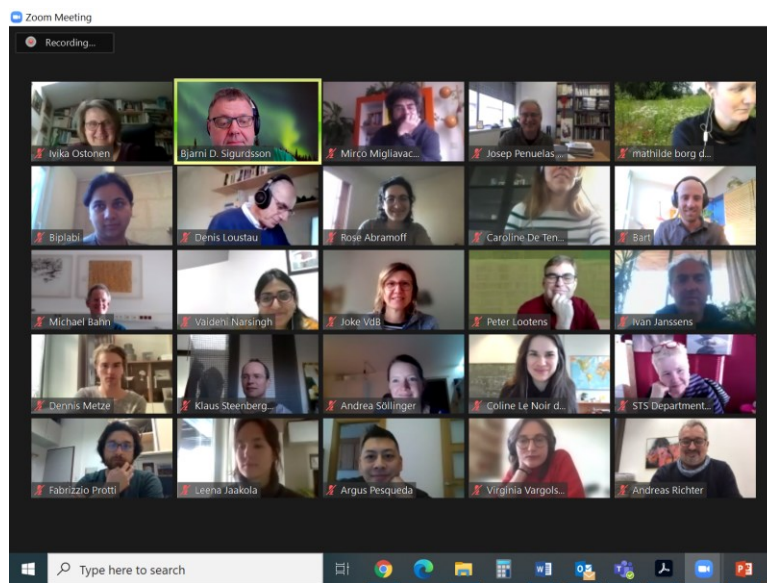


Figure 1. Snapshot from the FutureArctic session on March 1st.

Agenda of the ForHot/FutureArctic business meeting

1. Last year's minutes revisited
2. New ForHot partners
3. Main happenings since last meeting
4. Project outputs since beginning
5. Publication plans (pledges) in 2021-2022
6. Funding possibilities – ideas or plans
7. The 2021 field season and beyond!
8. Other issues
 - Next ForHot/FutureArctic meeting?
9. The ForHot 2020 conference overview

1. ForHot member overview now (2021)

The list of participants of the ForHot project during 2012-2020. Researchers active now in 2021 are in **bold/green**, but those not active are in **normal/brown**. Students who are still active in 2021 are in **bold/blue**; students or others who have finished or otherwise ended their work are in **bold/red**:

<p>Agric. Univ. of Iceland</p> <ol style="list-style-type: none"> 1. Prof. Bjarni D. Sigurdsson (coord.) 2. Páll Sigurðsson (Ph.D. student 2016-) 3. Ruth Tchana (Ph.D. student 2020-) 4. Narfi Hjartarson (BSc student 2020-) <ul style="list-style-type: none"> • Björk Kristjánsdóttir (technician 2020) • Antonia Lindau (internship student 2019) • Bernard Gill (internship student 2019) • Ben Wisniewski (internship student 2019) • Alice L. Sarolta Cosatti (internship student 2017) • Paige Guevarra (internship student 2017) • Julia Bischof (internship student 2017) • Gunnhildur E. G. Gunnarsdóttir (2016-2018) • Helena M. Stefánsdóttir (2011-2015) • Elín Guðmundsdóttir (M.Sc. student 2013-) • Damiano Cilio (B.S. student 2014). • Dr. Úlfur Óskarsson <p>Icelandic Forest Research – Mogilsa</p> <ol style="list-style-type: none"> 5. Dr. Edda S. Oddsdóttir <p>Svarmi ehf.</p> <ol style="list-style-type: none"> 8. M.Sc. Tryggvi Stefánsson 6. Amir Hamedpour (Ph.D. student 2020-) <p>Univ. Akureyri</p> <ul style="list-style-type: none"> • Dr. Brynhildur Bjarnadóttir <p>Univ. of Iceland / Soil Conservation Service</p> <ol style="list-style-type: none"> 9. Dr. Bryndís Marteinsdóttir <ul style="list-style-type: none"> • Rán Finnsdóttir (M.Sc student 2019-2020) • Nia Perron (M.Sc. student 2016-2017) • Ella Thoen (B.Sc. student 2011-2012) <p>Univ. of Antwerp - Belgium</p> <ol style="list-style-type: none"> 10. Prof. Ivan Janssens 11. Prof. Erik Verbruggen 12. Dr. Joke Van den Berge 13. Dr. Eric Struyf 14. Niel Verbrugghe (PhD student 2017-2020) 15. Johan de Gruyter (PhD student 2017-2020) 16. Coline Le Noir de Carlan (PhD student 2020...) <ul style="list-style-type: none"> • Dr. Sara Vicca (Post-doc 2017-2019) • Dr. Lucia Fuchslueger (Post-doc 2017-2019) • Chao Fang (PhD student 2018-2019) • Dr. Cindy De Jonge (Post-doc 2016-2018) • Dr. Niki Leblans (Post doc 2016-2017) • Dr. James Weedon (Post-doc) • Dr. Jennifer Soong (Post-doc) • Wendelien Meynzer (M.Sc. student 2014-) • Niki Leblans (PhD student 2012-2016) • Stephanie Van Loock (M.Sc. student 2014-2016) • Katherine Vande Velde (M.Sc. student 2014-2015) • Steven Dauwe (PhD student 2015-2017) • Lieven Michielsens (M.Sc. student 2014-2015) • Mattias Janssens (job student 2016) • Elien de Schutter (job student 2016) • Dajana Radujkovic (M.Sc. student 2014-2016) 17. Prof. Steven Latré 18. Priyesh Puluckul (PhD student 2020...) 	<p>Lund University</p> <ol style="list-style-type: none"> 49. Prof. Håkan Wallander 50. Prof. Erland Bååth 51. Dr. Per Bengtson <ul style="list-style-type: none"> • Jian Li (PhD student 2018...) • Jing Zang (PhD student 2017-2019) • Dr. Zhanfeng Liu (Postdoc 2016) • Dr. Magnus Ellström (Ph.D. student 2012) • Dr. Stephanie Reischke (Ph.D. student 2012) <p>Swedish Univ. Agric. Sci. (SLU)</p> <ul style="list-style-type: none"> • Prof. Thomas Kätterer • Dr. Monika Strömgren • Dr. Christopher Poeplau (Post-doc) • Hanna André (B.S. student 2014) • Agnes Bondesson (B.S. student 2014) <p>Umeå Univ., Sweden</p> <ol style="list-style-type: none"> 52. Dr. Niki Leblans (Post-doc 2018...) <p>Örebro Univ., Sweden</p> <ol style="list-style-type: none"> 53. Prof. Alf Ekblad <p>Univ. of Tartu, Estonia</p> <ol style="list-style-type: none"> 54. Prof. Ivika Ostonen 55. Prof. Jaak Truu 56. Ass.Prof. Marika Truu 57. Ass.Prof. Martin Maddison 58. Biplabi Bhattacharai (PhD student 2019...) 59. Arun Kumar Devarajan (PhD student 2020...) <ul style="list-style-type: none"> • Kaarin Parts (Ph.D. student 2014-2020) <p>EMU, Estonia</p> <ol style="list-style-type: none"> 60. Prof. Ülo Niinemets 61. Dr. Kristiina Mark 62. Upasana Sharma (PhD stud. 2021...) 63. José Ángel Morales Sánchez (PhD stud. 2021...) <p>Copenhagen Univ. - Denmark</p> <ol style="list-style-type: none"> 64. Prof. Per Gundersen 65. Dr. Klaus S. Larsen 66. Linsey Avila (PhD student 2020...) 67. Anna Theresa Edlinger (M.Sc. student 2016) <p>Aarhus Univ. - Denmark</p> <ol style="list-style-type: none"> 68. Prof. Martin Holmstrup 69. Dmitry Kutcherov (Post-doc 2017-2019) <p>DMR - Denmark</p> <ol style="list-style-type: none"> 70. Poul Larsen 71. Leena Jaakola (PhD student 2020...) <p>Univ. of Tromsø</p> <ol style="list-style-type: none"> 72. Dr. Alexander Tveit 73. Dr. Andrea Söllinger (Post-doc 2019...) <p>Univ. of Vienna - Austria</p> <ol style="list-style-type: none"> 74. Prof. Andreas Richter 75. Dr. Christina Kaiser 76. Lucia Fuchslueger (Post-doc 2020...) 77. Joana da Silva (PhD student 2018...) 78. Dennis Metze (PhD student 2020...)
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<p>19. Vaidehi Narsingh (PhD student 2020...)</p> <p>20. Bart Bussmann (PhD student 2020...)</p> <p>ILVO - Belgium</p> <p>21. Dr. Peter Lootens</p> <p>22. Dr. Caroline De Tender</p> <p>23. Dr. Greet Ruyschaert</p> <p>24. Joanna Pranga (PhD student 2020...)</p> <p>IMEC - Belgium</p> <p>25. Prof. Maarten Weyn</p> <p>26. Dr. Yorick De Bock</p> <p>27. Dr. Johan Bergs</p> <p>Thünen Institute - Germany</p> <p>28. Dr. Christopher Poeplau</p> <p>Univ. Greifswald, Germany</p> <p>29. Prof. Tim Ulrich</p> <p>30. Dr. Mathilde Dahl (Post-doc)</p> <p>ETH Zürich, Switzerland</p> <p>31. Dr. Tom Walker</p> <p>CzechGlobe, Czech Republic</p> <p>32. Dr. Karel Klem</p> <p>33. Dr. Otmar Urban</p> <p>Univ. S. Bohemia, Czech Republic</p> <p>34. Dr. Anne Daebeler</p> <p>Cardinal Stefan Wyszyński Univ., Poland</p> <p>32. Dr. Krassimira Ilieva-Makulec</p> <p>Vrije University, Amsterdam, NL</p> <p>33. Ass. prof. James T. Weedon</p> <p>34. Ruud Rijkers (PhD student 2018-...)</p> <ul style="list-style-type: none"> Benjamin Hearn (M.Sc. student 2014-2015) <p>Leiden Univ., NL</p> <ul style="list-style-type: none"> Prof. Peter van Bodegom <p>Univ. Eastern Finland</p> <p>35. Prof. Marja Maljanen</p> <p>36. Prof. Christina Biasi</p> <ul style="list-style-type: none"> Heli Yli-Moijala (M.Sc. student 2012-2018) <p>LSCE, Inst. Pierre Simon Laplace, France</p> <p>37. Dr. Rose Abramoff</p> <p>Bertley Lab - USA</p> <ul style="list-style-type: none"> Dr. Margaret S. Torn Dr. Jennifer Soong (Post-doc 2018-2020) 	<p>79. Moritz Mohrlok (MSc student 2019...)</p> <p>80. Prof. Ulrike Felt</p> <p>81. Virginia Vargolska (PhD student 2020...)</p> <p>82. Philipp Guendler (M.Sc. student 2018-2019)</p> <ul style="list-style-type: none"> Alexander Tveit (Post-doc 2018-2019) Judith Prommer (PhD student 2017-2018) Dr. Tom Walker (post-doc) <p>83. Prof. Michael Wagner</p> <p>84. Dr. Petra Pjevac</p> <p>85. Dr. Craig Herbold</p> <p>86. Dr. Andrew Giguere (post-doc 2019...)</p> <ul style="list-style-type: none"> Dr. Anne Daebeleer (post-doc) <p>Univ. of Innsbruck - Austria</p> <p>87. Prof. Michael Bahn</p> <p>88. Dr. Johannes Ingrisch</p> <p>89. Kathiravan M. Meeran (PhD student 2018...)</p> <p>90. Fabrizio Protti (PhD student 2020...)</p> <ul style="list-style-type: none"> Lena Müller (MSc student 2018) <p>VSI - Austria</p> <p>91. Dr. Liaqat Seehra</p> <p>BOKU - Austria</p> <p>92. Prof. Boris Rewald</p> <p>93. Dr. Gernot Bodner</p> <p>94. Pavel Baykalov (PhD student 2020....)</p> <ul style="list-style-type: none"> Dr. Hans Sandén Christoph Rosinger (PhD student 2016-2018) <p>Universitat Autònoma de Barcelona (UAB), Spain</p> <p>95. Prof. Josep Peñuelas</p> <p>96. Dr. Jordi Sardans</p> <p>97. Dr. Iolanda Filella</p> <p>98. Dr. Olga Margalef</p> <p>99. Dr. Albert Gargallo (post-doc 2016...)</p> <p>100. Dr. Sara Marañón Jiménez</p> <p>101. Dr. Guille Peguero (Post-doc 2018...)</p> <p>102. Argus Pesqueda (PhD student 2020...)</p> <ul style="list-style-type: none"> Dr. Mireia Bartrons (post-doc 2016-2019) Daijun Liu (Post-doc 2018-2019) Miriam Raluy (M.Sc. student 2018) Marta Ayala Roque (M.Sc. student 2016) <p>In total active in 2021:</p> <p>66 researchers, 8 postdocs and 28 PhD students and 3 MSc/BSc students</p> <p>30 universities/institutes</p> <p>15 countries</p>
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2. New members

We already welcomed Ülo Niinemets into the ForHot consortium in 2019 for planned studies in FN with Ivika. Two PhD students in his lab (Upasana and José) took part in the FA PhD course 2020. They and Kristiina Mark are interested to start measurements on cryptogam stress physiology (gas exchange, fluorescence, biogenic volatiles in GN and GO, etc.). This was endorsed by the meeting.

3. ForHot's & FutArc main happenings July 2020 – Feb 2021

- 30 June – 1 July: on-line ForHot/FutureArctic Meeting.
- June, Aug and Oct: Three FA campaigns: Ivika, Biblapi, Argus, Coline, Dennis et al.
- June Linsey and Klaus installed 4 x automated gas exchange systems
- July-Aug. Fabrizio installs his systems/does measurem.
- Aug. Ruth Phoebe makes harvest meas in GN, GO, NT

2021

- 1-3 March: on-line FutureArctic/ForHot Meeting.

4. Project outputs

Papers already out:

1. **JOURNAL PAPER:** O’Gorman et al. (2014) Climate change and geothermal ecosystems: natural laboratories, sentinel systems, and future refugia. *Global Change Biology*, 20(11):3291-3299.
2. **JOURNAL PAPER:** Bjarni D. Sigurdsson et al. (2016). Geothermal ecosystems as natural climate change experiments: the ForHot research site in Iceland as a case study. *Icelandic Agricultural Sciences* 29:53-71.
3. **JOURNAL PAPER:** Christopher Poeplau et al. (2017). Sensitivity of soil carbon fractions and their specific stabilisation mechanisms to extreme soil warming in a subarctic grassland. *Global Change Biology* 23: 1316-1327.
4. **JOURNAL PAPER:** Niki Leblans et al. (2017). Phenological responses of Icelandic subarctic grasslands to short-term and long-term natural soil warming. *Global Change Biology* 23(11), 4932-4945.
5. **JOURNAL PAPER:** Marja Maljanen et al. (2017). The emissions of N₂O and CH₄ from natural soil temperature gradients in a volcanic area in southwest Iceland. *Soil Biology and Biochemistry* 109: 70-80.
6. **JOURNAL PAPER:** Albert Gargallo-Garriga. (2017). Impact of soil warming on the plant metabolome of Icelandic grasslands. *Metabolites* 7(3) 44
7. **JOURNAL PAPER:** Martin Holmstrup et al. (2018). Resilience in functional diversity of Collembola subjected to long-term warming. *Functional Ecology* 32(5): 1304-1316
8. **JOURNAL PAPER:** Dajana Radujkovic et al. (2018). Prolonged exposure does not increase soil microbial community response to warming along geothermal gradients. *FEMS Microbiology Ecology* 94(2): fix174.
9. **JOURNAL PAPER:** Marja Maljanen et al. (2018). The potential effect of elevated soil temperatures on the production of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), nitric oxide (NO) and nitrous acid (HONO) from volcanic soils in southern Iceland. *Icelandic Agricultural Sciences* 31, 11-22
10. **JOURNAL PAPER:** Tom W. N. Walker, Christina Kaiser, Florian Strasser, Niki I. W. Leblans, Dagmar Woebken, Ivan A. Janssens, Bjarni D. Sigurdsson & Andreas Richter (2018). Microbial

temperature sensitivity and biomass change explain soil carbon loss with warming. *Nature Climate Change* 8: 885-889.

11. **JOURNAL PAPER:** Christopher Poeplau, Pierre Barre, Lauric Cecillion, Francois Baudin, Bjarni D. Sigurdsson (2019). Changes in the Rock-Eval signature of soil organic carbon upon extreme soil warming and chemical oxidation - A comparison. *Geoderma* 337 (2019): 181-190.
12. **JOURNAL PAPER:** Sara Vicca, Benjamin D. Stocker, Sasha Reed, William R. Wieder, Michael Bahn, Philip A. Fay, Ivan A Janssens, Hans Lambers, Josep Peñuelas, Shilong Piao, Karin T Rebel, Jordi Sardans, Bjarni D. Sigurdsson, Kevin Van Sundert, Ying-Ping Wang, Sönke Zaehle, Philippe Ciais (2018). Using research networks to create the comprehensive datasets needed to assess nutrient availability as a key determinant of terrestrial carbon cycling. *Environmental Research Letters* 13(12): 125006.
13. **JOURNAL PAPER:** Marañón-Jiménez S., Soong J.L., Leblans N.I.W., Sigurdsson B.D., Peñuelas J., Richter, A., Asensio D., Fransen E., Janssens I.A. (2018). Geothermally warmed soils reveal persistent increases in the respiratory costs of soil microbes contributing to substantial C losses. *Biogeochemistry* 138: 245–260.
14. **JOURNAL PAPER:** Kaarin Parts, Leho Tedersoo, Andreas Schindlbacher, Bjarni D. Sigurdsson, Niki Leblans, Edda Oddsdottir, Werner Borken, Ivika Ostonen (2019) Acclimation of fine root systems to soil warming: comparison of an experimental setup and a natural soil temperature gradient. *Ecosystems* 22(3): 457-472.
15. **JOURNAL PAPER:** Nicholas Rosenstock, Magnus Ellström, Edda Oddsdottir, Bjarni D Sigurdsson & Håkan Wallander (2019). Carbon sequestration and community composition of ectomycorrhizal fungi across a geothermal warming gradient in an Icelandic spruce forest. *Fungal Ecology* 40: 32-42.
16. **JOURNAL PAPER:** Tom W. N. Walker, et al. (2019). A systemic decadal-scale overreaction to soil warming in a grassland ecosystem. *Nature Ecology and Evolution* 4: 101-108
17. **JOURNAL PAPER:** Sara Marañón-Jiménez, et al. (2019). Coupled carbon and nitrogen losses in response to seven years of chronic warming in subarctic soils. *Soil Biology and Biochemistry* 134: 152-161.
18. **JOURNAL PAPER:** Cindy De Jonge, et al. (2019) Lipid biomarker temperature proxy responds to abrupt shift in the bacterial community composition in geothermally heated soils. *Organic Geochemistry*, 137, 103897. doi:<https://doi.org/10.1016/j.orggeochem.2019.07.006>
19. **JOURNAL PAPER:** Dmitry Kutcherov, et al. (2020). Temperature responses in a subarctic springtail from two geothermally warmed habitats. *Pedobiologia - Journal of Soil Ecology* 78: 150606. <https://doi.org/10.1016/j.pedobi.2019.150606>
20. **JOURNAL PAPER:** Johan De Gruyter, et al. (2020) Patterns of local, intercontinental and inter-seasonal variation of soil bacterial and eukaryotic microbial communities. *FEMS Microbiology Ecology* 96, fiae018.
21. **JOURNAL PAPER:** Jing Zhang et al. (2020). The influence of soil warming on organic carbon sequestration of arbuscular mycorrhizal fungi in a sub-Arctic grassland. *Soil Biology and Biochemistry* 147(August 2020): 107826

22. **JOURNAL PAPER:** Christopher Poeplau et al. (2020). Strong warming of a subarctic Andosol depleted soil carbon and aggregation under forest and grassland cover. *Soil* 6, 115–129.
<https://doi.org/10.5194/soil-6-115-2020>

SINCE LAST MEETING:

23. **JOURNAL PAPER:** Marja Maljanen, Heli Yli-Moijala, Bjarni D. Sigurdsson, Christina Biasi (2020). Stable isotope method reveals the role of abiotic source of carbon dioxide efflux from geothermally warmed soil in Southern Iceland. *Icelandic Agricultural Sciences* 33, 41-56, doi.org/10.16886/IAS.2020.05

For more, see www.forhot.is /publications

5. Publication plans 2021-2022



We now have 23 papers that give data from the ForHot sites, whereof 1 appeared since the ForHot meeting in 2020 (see above) and 7 have been submitted or almost ready to be submitted (see below).

The following papers have been submitted or are just to be submitted and should appear soon:

1. **JOURNAL PAPER:** Albert Gargallo et al. The next metabolnomics paper - GN GO soil from 2015 (in press in *European Journal of Soil Biology*).
2. **JOURNAL PAPER:** Andrea Söllinger et al. MetaTranscriptome data from GN/GO on functional diversity (submitted).
3. **JOURNAL PAPER:** Niel Verbrugghe, Niki Leblans et al. 2013 and 2018 GN and GO SOC-changes (submitted).
4. **JOURNAL PAPER:** Chao Fang et al. Fine-root turnover in GN, GO and NT (in preb.)
5. **JOURNAL PAPER:** Joana Séneca et al. regulation of genes involved in the degradation of organic nitrogen substrates in GN and GO (in preb.)
6. **JOURNAL PAPER:** Páll Sigurdsson et al. Fine-root turnover in FN (in preb.)
7. **JOURNAL PAPER:** Thakur, Holmstrup et al. Soil fauna in the Seasonal Experiment in GN (in preb.)

The participants at the 2021 meeting had pledged to submit and publish the following papers (and some were extended for those who did not attend :o) – the deadline for those has now been extended to the 2022 meeting Those on the list below list that will not have submitted their pledged paper, promised that at the next *in situ* meeting (2022) they would bring a bottle of wine and give to another person on the list who had succeeded to keep his/her promise.

8. **James Weedon & Erland Bååth et al.** The soil bacteria growth and composition at FN/GN in 2012
9. **Ruud et al.** Bacterial amplicon resequencing of 2012, 2013, 2015 and 2016 samples from GN
10. **Ruud et al.** Ts Threshold in microbial community compositions in different soils (incl. FN/GN)
11. **Pall Sigurdsson et al.** Aboveground and belowground phenology in FN
12. **Pall Sigurdsson et al.** Comparison of three methods to estimate fine-root turnover
13. **Bjarni D. Sigurdsson et al.** Tree growth and forest productivity in FN
14. **Bjarni D. Sigurdsson et al.** C-balance changes in FN during 2013-2018
15. **Bjarni D. Sigurdsson et al.** Effects of Land Use Change synthesis paper
16. **Per Gundersen et al** Leachates in FN 2015-2018
17. **Krassimira et al.** Nematodes in FN, GN and GO in 2014
18. **Niel Verbrigghe et al.** First paper from TNT
19. **Niel Verbrigghe, et al.** Decomposition results from TNT
20. **Niel Verbrigghe et al.** Pulse-labelling study 2018 in TNT – PFLA results
21. **Niel Verbrigghe + Wallander, Poeplau & Richter, Soong et al.** Fractionations of GN/GO soil with different methods.
22. **Kathiravan M. Meeran et al.** Pulse-labelling study 2018 in TNT 13C results and fluxes
23. **Matthilde Dahl et al.** MetaTranscriptome data from GN/GO on functional diversity
24. **Andreas Richter et al.** Seasonal experiment in GN/NT in 2017-2018 → To be discussed at a meeting in May/June how to publish these results
25. **Sara Marañón Jiménez et al.** N-cycle & polymerization from Seasonal Experiment in GN/NT
26. **Philipp Guendler et al.** Seasonal Experiment I in GN/NT in 2017-2018
27. **Ivika Ostonen, James Weedon, et al.** FN synthesis paper
28. **Bryndís Marteinsdottir, Nia Perron, et al.** (2017). Plant phenology and fitness at Hengill, GN and GO
29. **Guille Peguero et al.** Soil invertebrates and environmental DNA from GN/GO
30. **Jordi Sardans et al.** SEM of GN and GO (pending database updates)
31. **Tom Walker, Erik V et al.** Synthesis on plant and soil community changes due to warming (pending database updates)
32. **Oh Mann** Carbon chickien & N eggs
33. **Niki Leblans, Ivan Janssens et al.** Effect of short- and long-term soil warming on plant and soil stoichiometry in GN and GO

NEW promises in 2021

34. **Biplabi Bhattacharai et al.** First paper (root biomass issues)
35. **Ruth Phoebe Tchana et al.** First paper (interannual variation in NDVI, PRI and CCI)
36. **Amir Hamedpour et al.** First paper (e.g. warming induced greening/browning)
37. **Leena Jaakola et al.** First paper. Leachates in GN/GO 2015-2020
38. **Pavel Baykalov et al.** First paper (Root segmenting)
39. **Argus Pesqueda et al.** First paper (Metabolomics from the FA core-experiment)
40. **Argus Pesqueda et al.** Second paper (TNT metabolomics)

41. **Joanna Pranga et al.** First paper (UAV multispectral estimate of biomass production in managed grasslands)
42. **Holmstrup et al.** Soil fauna from Seasonal Experiment I
43. **Rose Abramoff** Testing T-sensitivity functions w. Millennial model
44. **Ivan Janssens, ESRs et al.** Recent technological/methodological advances in ecological research

6. Funding news

- Sara M. applied for a “small” Spanish grant for starting a transplant experiment in GO. Still pending (but maybe she could not get it, because now she has a Ass. Prof. position at CREAM).
- Andi, Erik V and Tina plan to submit a grant proposal to FWO/Austria to continue with microbial ecology research. Microcosm transplant activity (coordinated w. Sara M.) and the new GO seasonal experiment
- Ivan submitted a ForHot-related grant proposal to continue Antwerp’s involvement in new activities. Made it now to the final round (33% chance)
- Alex and Andrea are (probably) going to re-submit a grant proposal to add to Mathilde’s new seasonal experiment. More microcosm studies + pure cell-culture studies...
- Bjarni plans to submit a grant proposal to Icel. Res. Council in June 2021. Still not decided the topic.

7. The upcoming 2021 Fieldseason

The following tentative time plan was made for planned fieldwork in Iceland in the summer/autumn of 2021:

Site technicians/interns												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Palli (site man; 25/25%)												
Katharina, AU (intern)												
Agatha, FR (intern)												
Timon, BE (MSc)												
FAcores (GN:GO)				xx		???						
Priyesh (GN:GO)			xxxx				xxxx					
Biblapri (GN:GO)			xx			?	xxxxx (pulse-lab)					
Fabrizio (GN:GO)				xxxx			xxxxxx			xxxx		
Linsey (GN1-3)				xxxx			xxxxxxx			xxxx		
Pavel (GO or Lin.)				xxxx			xxxxx			xx		
Leena (hydrol)							xxxx					
Argus							xxxxxx (pulse-lab)					
Virginia (2 nd ment)				xx			xxxx					
Seasonal II (GO)			(??)				xxx			xx		
Pulse-Label (GO)							xxxxxxx					
Christina Biasi (FN/GN)					xxx		????					
Anne D					???		??					
EMU							xxxx					
Prepare Seasonal III (GO)							xxxx			xxxx		
Aarun			??									

8. Other issues

- **Upcoming meetings**

- a) **The planned field course at the ForHot sites 31 May – 3 June has been cancelled**
- b) **Pulse-labelling campaign in GO in July 2021**
Michael will organize an on-line meeting later in March to continue planning this activity.
- c) **Seasonal Experiment I (2017/2018) in GN. On-line meeting in May/June 2021,**
Andi will organize a workshop on the analysis and data from the “seasonal experiment” for those who are involved in that activity.
- d) **Sep 2021, Traveling FA PhD course (Vienna – Antwerp – Copenhagen).**
All the Fut.Arc. PhD students will be taking this course.
- e) **Feb 7-9, 2022 Next general Fut.Arc./ForHot meeting.**
The idea to organize it in connection with the 3rd PhD course in Antwerp was endorsed. At a FA Supervisory Board meeting on 10/3 the dates were set as **7-9 Feb, 2022.**

9. The 2021 mini-conference on recent findings in Fut.Arc. and ForHot and a workshop on different project activities

March 1-3, 2021

Pdfs from all the talks and most workshop sessions are available on a closed dropbox folder. The address is https://www.dropbox.com/sh/upp0ub8fk21pti0/AAAWq6GbfnRaNpiidCZ_-mwZa?dl=0

Session 1: The FutureArctic ESR conference.

All ESRs gave a concise presentations presenting the MAIN ongoing and planned activities and possibly their first obtained results – so everybody gets a quick overview over the status of the FutureArctic ITN.

Talk 01: **Bjarni D. Sigurdsson** Future Arctic ITN project plan 2020-2023 recap.

The highflyers and their ground truther

Talk 02: **ESR02 Joanna Pranga.** Visual, NDVI and hyperspectral assessment of grassland plant and vegetation traits

Talk 03: **ESR10 Amir Hamedpour.** *Development of an autonomous UAV application for image based ecosystem climate response assessment*

Talk 04: **ESR7 Ruth Phoebe Tchana.** *Unmanaged sub-Arctic grassland growth-processes and plant stress evolution in a warmer world*

The mega-techno wizards

Talk 05: **ESR13 Vaidehi Narsingh.** *Scientific Machine Learning for complex ecosystem interaction analysis*

Talk 06: **ESR14 Bart Bussmann.** *Next Generation Neural Networks for UAV-based remote sensing*

Talk 07: **ESR09 Priyesh Puluckul**. *Fast prototyping platform to enable sensor communication technology*

Talk 08: **ESR12 Pavel Baykalov**. *Automatizing root imaging and spectral analyses of the rhizosphere – R&D interfacing mechatronics, deep learning and roots*

The flux and dynamics tricksters

Talk 09: **ESR03 Biplabi Bhattarai**. *The functional rhizobiome in warming grasslands*

Talk 10: **ESR06 Linsey Avila**. *The carbon balance in sub-arctic ecosystems*

Talk 11: **ESR05 Fabrizio Protti**. *Soil CO₂ efflux and priming effects in subarctic grasslands*

Talk 12: **ESR11 Leena Jaakola**. *Development of an automated sampler for subsoil nutrient flows*

The best is always left until last

Talk 13: **ESR01 Coline Le Noir de Carlan**. *Microbiome structure of warmed grasslands*

Talk 14: **ESR08 Argus Pesqueda**. *Plant and soil metabolome in a warming subarctic*

Talk 15: **ESR04 Dennis Metze**. *Microbiome physiology and microbial interactions*

Talk 16: **ESR15 Virginia Vargolska**. *“Big data” and shifts in research practices*

Session 2: The General FutureArctic-ForHot mini-conference.

Talk 17: **Bjarni D. Sigurdsson**. ForHot and FutureArctic research status: a VERY quick overview.

Talk 18: **Páll Sigurðsson, Ruth P. Tchana, Amir Hamedpour**. 2020 data available from the Iceland team.

Talk 19: **Arun Kumar Devarajan**. The structural and functional adaptation of soil and plant microbiomes in climate and land use change in subarctic and boreal ecosystems

Talk 20: **Andrea Söllinger**. What’s new in Tromsø?

Session 3. New ForHot project: A new Seasonal Experiment in GO in 2021-2022 - Seasonal dynamics in the soil microbial food web.

Presenter: **Mathilde Dahl**

Session 4. New ForHot project: Using volcanic-geothermal fields to investigate transfer of deep geological C sources into terrestrial food webs

Presenter: **Christina Biasi**

Session5. The TNT experiment.

Talk 20.5: **Lucia Fuchslueger**. Introduction to the TNT experiment

Talk 21: **Kathiravan Meeran**. Effects of soil warming and N availability on the fate of recently assimilated carbon

Talk 22: **Niel Verbrugghe**. Effects of nitrogen availability, long-term and short-term warming on soil organic matter

Talk 23: **Lucia Fuchslueger**. Warming effects on litter decomposition and stabilization of organic matter in soil

Talk 24: **Fabrizio Protti**. Following TNT into Future Arctic

Session 6. 2021 pulse-labelling experiment in GO:

Presenter: Michael Bahn

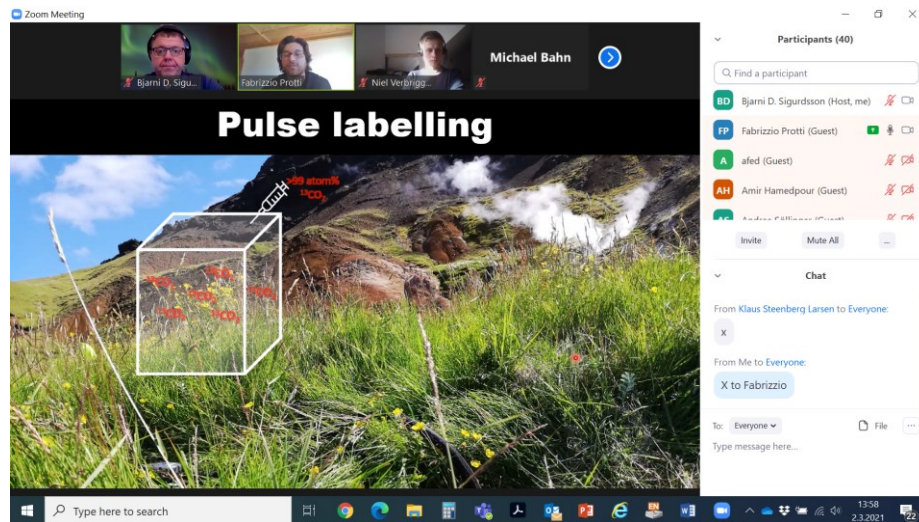


Figure 2. Snapshot from Session 6 on the planned pulse-labelling experiment in GO

Session 7. 2021 gas exchange measurements:

Presenter: Klaus S. Larsen

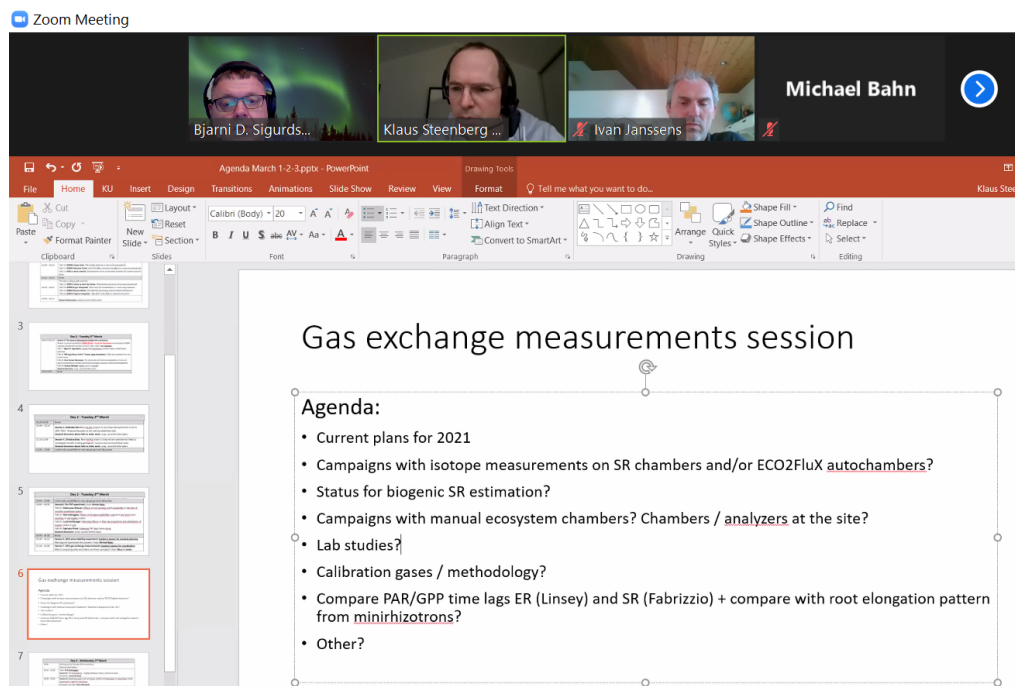


Figure 3. Snapshot from Session 7 on the planned pulse-labelling experiment in GO

Session 8. The FutureArctic – ForHot database: Status and future plans

Presenter: Yorick De Bock

SELECT AND DOWNLOAD THE DATA FROM THE DATABASE DATABASE TOOL

- Database hosted on Microsoft Azure, login via Office365 or Microsoft account
 - Data Explorer App from Microsoft Azure to access to data
 - Two data tables: one per type of data
- Because of the common template and format, data can be selected from multiple datasets from the same type
- Knowledge about the query language
 - Small learning curve
- Data can be exported directly to excel or CSV

Figure 4. Snapshot from Session 8 on the FutureArctic-ForHot database

Session 9. Modelling work so far at ForHot. Update and discussion on what other model experiments might be interesting.

Presenter Rose Abramoff

MILLENNIAL V2 EVALUATION

EGU21-9795 – Site-level simulations of measurable soil fractions with the Millennial V2 soil model
Session CI4.34 – Using Earth system science to understand climate change and its impacts: Results of the Franco-German “Make Our Planet Great Again” research initiative and beyond
<https://github.com/rabramoff/Millennial>

Figure 5. Snapshot from Session 9 on the modelling activities within ForHot

Session 10. New ForHot project: Finding NiMO (*Illuminating the interactions between nitrification and methane oxidation and the ensuing ecological impacts*). Short introduction to a new ForHot related project funded by the Czech Science Foundation

Presenter: **Anne Daebeler**

Session 11. The GN 2017-2018 Seasonal Experiment. Planning of a later final meeting in the spring of 2021 and writing up the results.

Presenter **Andreas Richter**

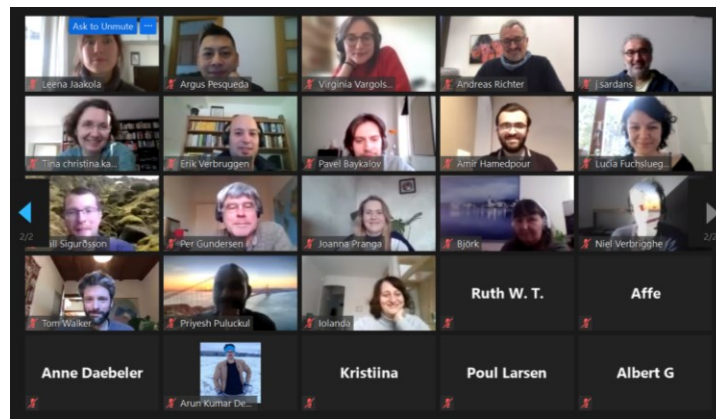


Figure 6. More participants attending on March 1st.

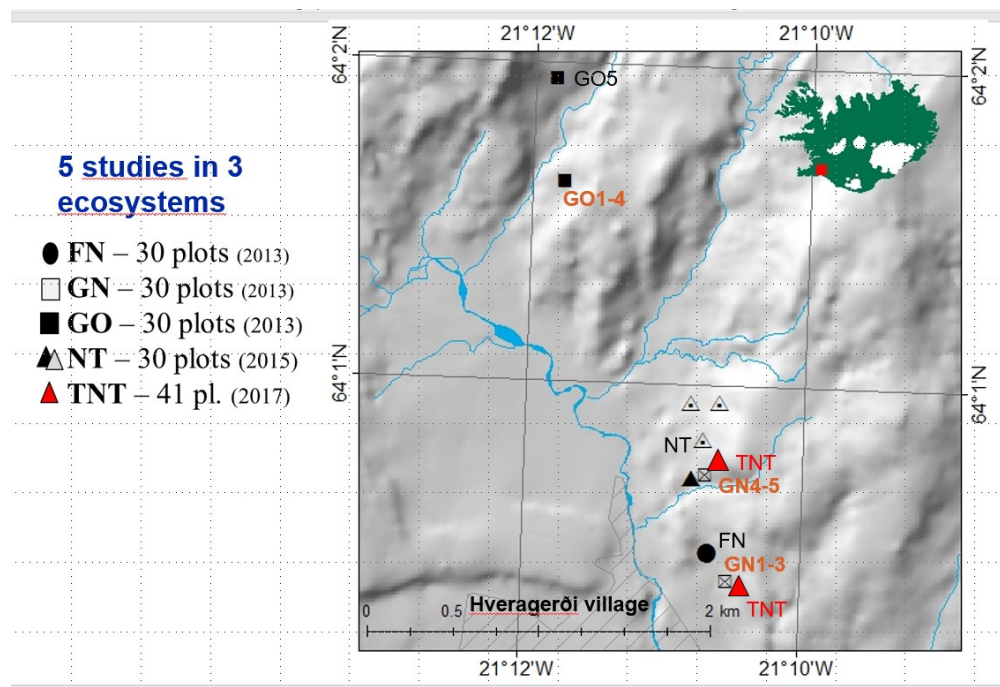


Figure 7. The 5 field-experiments in ForHot. From Bjarni's Talk 01.


What are the main research questions we can ask?		
<div> <div> Research questions: </div> <div> Effects of soil warming (GN, GO, FN) Effects of N-addition (NT) Warming x N interaction (TNT) </div> <div> Medium- vs. Long-term warming (GN/GO)? </div> <div> Ecosystem Differences (FN/GN)? Is warming response mainly an indirect N response (NT/GN/TNT)? Gradient responses (thresholds)? </div> <div> Topsoil vs. subsoil responses? </div> </div> <div> <div> Key findings: </div> <div> <ul style="list-style-type: none"> Large and linear loss of topsoil SOC during first 5-7 years Prelim: indications for less subsoil changes: Losses of SON of similar magnitude! New 'steady state' in SOC/SON reached and maintained Threshold responses in many process and community when warming >2x MAT </div> <div> Key papers: </div> <div> <ul style="list-style-type: none"> Sigurdsson et al. 2016 <i>Icel. Agric Sci.</i> => The site info paper. Radujković et al. 2018 <i>FEMS Microbiol. Ecol.</i> => short vs long term response of microbial community Walker et al. 2020 <i>Nat. Ecol. Evol.</i> => short vs long term response (GN/GO) Walker et al. 2018 <i>Nat Clim Change</i> => Acclimation of Rs is mediated through SOC/microbial biomass changes. </div> </div> <div> <div> Click to </div> <div> Do data synthesis across experiments Initiate more modelling Test new hypotheses! </div> <div>  </div> <div> prof. Ivan Janssens... </div> <div> OH 4 </div> </div>		
02.03.2021	FutureArctic-ForHot Annual Workshop 2021	

Figure 8. The main research questions we can ask in ForHot. From Bjarni's Talk 01.